

PRICE STRUCTURE IN A TWO-SIDED PLATFORM

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ABSTRACT

The objective of this paper is to analyze the pricing structure on both sides of the market keeping in mind that there exist widely differing institutional arrangements or ownership structures of platforms. The platform may be owned by a monopoly intermediary, by many small intermediaries, or by agents active on each side of the platform, such as buyers and sellers. Dispersed platform ownership may further be distinguished by contractual arrangements and property rights: incumbent platform owners may or may not have the right to restrict entry onto the platform. Belonging to a common platform does not rule out the emergence of "within-platform" competition, which makes the two-sided platform challenging, and complex case of platform competition.

Key Words: -Competition, Platforms, Pricing, Multi-homing, Two sided Market.

INTRODUCTION

Two-sided platforms refers to a situation where two distinct user groups interact with each other through a common platform and the value of joining the platform depends on expectations about the opposite network size. Typically, these two distinct customer groups cannot contract directly. The transaction costs of the customers individually reaching enforceable agreements to internalize network effects are too high, and would result in free rider problems. As a result a third-party usually creates a place or space "a platform" where the different groups of consumers/users can get together. In such situations, the need to get on board agents on all sides of the platform creates a so-called "chicken and egg" problem in that members of each group are willing to participate in the market only if they expect many members from the other side to participate.

According to both Evans (2004) and Reisinger (2003) a platform (or market) is said to be two-sided "at any point in time" if there are:-

- Two distinct groups of agents or customers;
- The value obtained by one class of customers increases with the number of the other class of customers; and

- An intermediary is necessary for internalizing the externalities created by one group for the other group.

The relevance of the two-sided nature of platforms depends importantly on three elements:-

- a) Indirect network externalities,
- b) Pricing structure, and
- c) The pattern of adhesion (“homing”) to the platform.

In two-sided markets, customers in each group obtain value from interacting with customers from the other group, and this value is greater when more customers use the platform. There are network externalities that operate across the two groups of customers. For example, in electronic payments, a brand of credit card is more valuable to a merchant, the more cardholders carry the card; conversely, a brand of credit card is more valuable to a cardholder, the more merchants accept the card. Similarly a commercial website is more valuable to sellers if more potential buyers visit the site, and is more valuable to buyers if more sellers offer products and services using the site.

The two-sidedness of a market is a matter of degree. In some markets, the network interactions between the two sides are so significant that both sides of the market are important for economic analysis. An important function of platforms is to attract both groups of customers in sufficient numbers or in a suitable balance. If a platform were to attract only one group of customers (e.g., service providers but not consumers of such services), there would be no interactions between groups. If one group of customers is more difficult to attract than another, platforms may structure their pricing so that one group pays less than the other. In some cases, one group of customers may be paid to participate in the platform. A market is considered two-sided if the volume of interactions on a platform depends on the way in which the platform allocates prices across the two groups of customers, as well as on the total price charged to the two sides.

COMPETITION & PRICING IN TWO-SIDED MARKETS

A central question for competition policy is how competition affects prices. One of the most basic notions is that competition drives prices toward the marginal cost of production, increasing economic efficiency and consumer surplus. In a two-sided market, it is possible for competition between platforms to have different effects on each side of the market, making conclusions about prices less clear. One possibility is that competition reduces market power and prices on both sides of the market. The price decrease may be stronger on one side of the market than the other, but consumers on both sides of the market benefit. Another possibility, however, is that competition

reduces market power and price on one side of the market, but leads to the same or higher price on the other side of the market.

In two-sided networks, users on each side typically require very different functionality from their common platform. Given these different requirements, platform providers may specialize in serving users on just one side of a two-sided platform. Nonetheless, whether a platform is trying to achieve a dominant position on one or both sides of the market, or competing against several others, it faces the problem of attracting both sides of the market simultaneously.

Rochet and Tirole (2004) argue that the defining feature of two-sided platforms is that there are different ways of breaking up prices across buyers and sellers, and how prices are set is not neutral. For example, newspapers sell papers to consumers at less than the marginal production cost and make money on advertisers, and eBay devotes a part of its revenue stream to providing services to large sellers. However, the ability to balance prices across the two-sides of a platform depends also on the range of pricing options available to the platform owners:-

- Platforms might charge for their services on a lump-sum basis. That is, an agent's tariff does not explicitly depend on how well the platform performs on the other side of the market. One example is Windows OS, which is generally sold at a posted price.
- Alternatively, it may be technologically feasible to set the tariff as a function of the platform's performance on the other side. One example of this practice is a TV channel or a newspaper that makes its advertising charges an increasing function of the audience or readership it obtains (to do this there must be a credible third party which can accurately estimate audiences).
- In some cases the platform owner may be able to charge for actual interactions or even sign credible contingent contracts making payments dependent on subsequent participation and transaction levels. Complicated contracts obviously have the potential to extract consumer surplus more fully, but in some circumstances could also make a dominant firm much more susceptible to entry and thus greatly limit profits. For instance, a potential intermediary could attract all buyers by promising to make large payments to them if it fails also to attract all sellers away from the incumbent intermediary. Important examples of this are credit and debit cards (where the charge paid by retailers is levied as a percentage of the revenue transacted) or telephony (where the relevant charges are levied on per-minute basis). Also, the bulk of a real estate agent's fees are only levied in the event of a sale.

The crucial difference between these pricing instruments is that inter-group network externalities are less important with per-transaction charges. Since a fraction of the

benefit of interacting with an extra agent on the other side is eroded by the extra charge incurred. For instance, when the charge for placing an advertisement in a newspaper is levied on a per-reader basis, an advertiser does not have to form a view about how many readers the newspaper will attract when it decides whether to place an advertisement. It will place an advertisement when its perceived benefit, which is most naturally considered to be expressed on a per-reader basis, exceeds the per-reader charge, and this calculation does not depend upon the total number of readers; Because network effects are lessened when advertisers pay charges on a per-reader basis it is possible that platform profits are higher when this form of charging is used.

At the same time charging on a per-transaction basis may be an excellent entry strategy for a competing platform. If an agent has to pay a new platform only in the event of a successful interaction, then that agent does not need to worry about how well the new platform will do in its dealings with the other side. That is to say, to attract one side of the market the new platform does not first have to get the other side "on board".

PRICING STRUCTURE AND CUSTOMER GROUPS

It is often observed that in two-sided platforms the price structure to get both sides on board and optimize usage of the platform is usually asymmetric with prices on one side substantially above those on the other side. Moreover, different firms choose different beneficiaries. In streaming video, portable documents, and advertising, for example, the industry norm is to subsidize content consumers and charge content developers. The opposite, however, holds true for operating systems and multiplayer games in which content developers receive subsidies and consumers pay to join the network.

Parker & Aylstine (2000) showed that the pricing structure depends on cross-price elasticity's as well as the relative sizes of the two-sided network effects. The intuition is that the existence of indirect inter-group network effects implies that in order to attract one group of users, the platform owner may subsidize the other group of users. Demand curves are not fixed; with positive cross-side network effects, demand curves shift outward in response to growth in the user base on the network's other side. A platform owner serving two sides of the platform can set prices more efficiently by internalizing these two-sided inter-group externalities. Independent firms serving either market separately lose this advantage. Historically, for example, Adobe's portable document format (PDF) did not succeed until Adobe priced the PDF reader at zero, substantially increasing sales of PDF writers.

Stimulating value adding innovations is another reason to subsidize adoption. Relative to Apple computer's initial pricing, Microsoft gave away software development kits and charged no royalties to applications developers leading to more rapid

development of applications for MS Windows. Instead, Microsoft made its profits by charging end-users prices well above costs. This pricing strategy is sometimes referred to as “divide – and-conquer”: subsidizing the participation of one side (divide), generally the more price sensitive side, and recovering the loss on the side whose demand increased more strongly in response to growth on the other side (conquer).

Irrespective of the pricing instrument the optimal pricing structure for a two-sided platform depends on the following factors:-

- a) The price elasticity's of demand on each side of the platform. The side that values the platform more will pay more.
- b) The relative strength and characteristics of the indirect network effect between the two sides.
- c) The level of competition from other platforms and substitute products on both sides. These include the extent of multi-homing and product differentiation.

The pricing strategies by platform owners are not necessarily designed to recover the operating costs of one side or the other, but are set to maximize profits by getting both sides on board and optimizing usage of the platform. As a result the two sides of the platform prices may not reflect costs on either side. Many platforms price below the marginal cost of providing the platform on one side and substantially above total cost on the other side. Consequently, profit maximizing principles in single-sided platforms offsetting marginal revenue to marginal cost on each side of the platform will not generally result in optimal prices for a platform owner. More generally, the relationship between the prices and costs on both sides are interdependent and complex and the simple formulae of single-sided markets do not apply.

THE FACTORS OF COMPETITION

In principle, competition concerns are the same whether firms compete in two-sided platforms, multisided or single-sided markets. Firms supplying two-sided platforms can exercise their market power unilaterally or through coordinated action with other firms by engaging in anti-competitive practices that harm consumer welfare and economic efficiency.

Wright (2004) points out two-sided platforms do present some problems for competition policy. For instance, an efficient price structure may not reflect relative costs; a high price cost margin is not generally an adequate indicator of market power; a price below marginal cost may be unrelated to predation and, importantly an increase in competition may lead to a less efficient or less balanced price structure, thus harming one side of the platform more than the other.

- *Market Power*

As explained above, the platform operator sets the price to each side in a manner that reflects the indirect network effects. It is often argued that market power such as the ability to raise prices above competitive levels is more constrained than in single-sided market, other factors remaining the same, because of this interdependence of demand on both sides of the platform. A rise in price on one side of the market will not only reduce sales on that side but may lead to a fall in demand on the other side arising from the indirect network effect. A fall in demand by customers on one side will reduce the value of participation in the platform on the other side. In turn the fall on the other side will trigger a further fall in demand on the side experiencing the price increase. The feedback effects could lead to a substantial fall in total demand for the platform that could make the price increase unprofitable.

As Ordober (2008) suggests, however, this reasoning is incomplete and somewhat misleading. The mirror argument is also correct: by charging a low price on one side of the platform the platform owner attracts more agents to that side, thus improving the attractiveness of the platform for the other side and reducing the elasticity of demand. As a result, at least in principle, a low price on one side of the market lessens the adverse effects of a price increase to the participants on that side. Further, depending on the factors discussed in the previous section a platform operator may exploit the relative adhesion pattern, charging a higher price to the multi-homing side and a lower price to the single-homing side.

A second constraint often alleged to exist on market power for two-sided platforms is the need for it to be acquired and maintained on both sides of the market in order to achieve profits substantially above competitive levels. Having market power one side is not enough. If there is limited competition on side A of a market but strong competition on side B, the profits earned on side A will be competed away over time on side B; but this reasoning also implies that entry might be difficult. First, because both sides of the market are needed for the product or service to function (i.e., the provider must get both sides of the market on board), new entrants face a form of the chicken-and-egg problem. This problem is probably fairly easy to overcome in some two-sided platforms, but quite difficult in others. For example, a new payment network likely would find it considerably more difficult to obtain the required critical mass of both issuers and merchants.

The difficulty of entry is further increased in some two-sided platforms because of the presence of particularly strong inter-group network effects. Not only must the new entrant simultaneously convince both sets of customers to purchase its product, but it must also overcome the challenge that for many customers the value of purchasing the

product or service from the established provider is likely significantly greater than from purchasing from the start-up.

This analysis, however, is even more complex than it appears at first. As Parker and Aylstine (2000) point out an incumbent firm on one side of the platform, say a content producer for one format probably does not welcome entry by a competing firm producing similar content. Buyers in the other side of the platform, however, welcome entry because it increases the prospect of a viable format should the incumbent fail. It also increases variety while possibly lowering prices. This increases both the value to individuals and the number of individuals willing to switch formats. This may lead to an expansion of the consumer side of the platform. Hence own-market entry may expand participation on the other side of each transaction. Content creators may not object to other content-providing firms if effective consumer demand rises instead of falls.

In sum, the implication from the literature is not that two-sided platforms cannot have market power but, rather, that a great deal of caution has to be exercised in inferring such market power from standard indicia of market power.

Regarding market definition the application of the test of Small but Significant and Non-transitory Increase in Price (SSNIP) many authors have pointed out that it cannot be usefully applied to one side of the platform in isolation. For a two-sided platform, an increase in the price on one side has implications for demand on the other side and thus for the overall profitability of the platform and impact of the price increase itself. A SSNIP test based on one side of the platform alone will not capture the effects of the constraints on a price increase from the interdependence of demand on both sides and can lead to a market being too narrowly defined. A similar problem applies to the application of Critical Loss Analysis (CLA) which is often used in conjunction with the SSNIP test. However, as Ordober (2007) again explains, this is not an unfamiliar complication: in the presence of complementary components a hypothetical monopolist must consider how a price increase on one component may lower demand, and revenues in the market for its complement. Of course it is somewhat more complicated when the link depends on inter-group network effects since generally the hypothetical two-sided platform must not only find the optimal price level but also the optimal price structure. However, these problems are not insurmountable and (certainly as a guiding concept) both the SSNIP test and CLA can still be applied with modifications.

- *The limits of competition policy*

In the model proposed by Armstrong (2006) platforms exploit their monopoly position on the multi-homing side by setting high charges to that group. How high these charges are depends on how much the single-homing group cares about the volume of

business on the multi-homing side. The profits from the multi-homing side are used to fund aggressive marketing efforts towards the single-homing side. Further Armstrong points out that even if the platforms do not make excessive profits overall, the multi-homing side faces too high a charge from the point of view of social welfare.

Bolt and Tieman (2006) in a comparatively simple two-sided platform model, obtain a similar result. They show that in the social optimum, platform pricing leads to an inherent cost recovery problem. This result is driven by the intergroup network effect of participation that users on either side of the market exert on the opposite side. The contribution of this positive externality to social welfare leads the social planner to choose a corner solution, in terms of full participation of the more elastic buyers' side of the market and recovering costs from the price-inelastic sellers' side. In fact a social planner will price below marginal costs, leading to an under-recovery of costs and hence an operational loss for the platform. The positive network externalities operate like economies of scale on demand, analogous to the case of a natural monopoly. It follows that even adequate competition policy enforcement alone may not always lead to best outcomes. This suggests, at least in some instances regulation may be pertinent.

In particular, since the platform network generates positive social welfare, compensation through external subsidies from the social planner or cross-subsidization from other sources of income could be warranted. As Bolt and Tieman (2006) also point out, however, in a dynamic perspective, subsidies may enhance the rapid development of more advanced networks, but could stifle innovative potential if they induce monopoly platforms to remain idle and have a quiet life. Another possibility would be to facilitate the use of more complex pricing mechanism such as two-part tariffs. Alternatively, the social planner might instruct the platform to implement Ramsey pricing¹, that is, to set prices that optimize social welfare under a balanced budget constraint. However, these types of solutions have second-best distortionary side effects, which should be taken into account.

- *Anti-competitive foreclosure² in two-sided platforms*

Typically, large two sided platforms, especially in the "new economy" display substantial economies of scale arising from large fixed costs in developing and maintaining a platform and relatively low marginal costs in serving both sets of customers. Where substantial economies of scale exist, the typical market structure is

¹Proposed by Frank Ramsey, it is also called inverse elasticity rule. It states that if prices are to be increased, it is a good strategy to increase the markup on goods with the most inelastic demand, because consumers or users will buy them anyway.

²The legal process by which a mortgage lender or other lien holder, obtains a termination of a mortgage borrower's equitable right of redemption, either by court order or by operation of law.

likely to consist of a few large firms each with significant market power. Strong network effects reinforce the trend towards a concentrated market structure. Platforms with more customers on one side are more valuable to customers on the other side and become more valuable as the demand from each side grows. In a platform with large economies of scale, unit costs fall as demand grows and profit margins increase. In these market circumstances, firms that are first or early movers have a natural advantage, which combined with economies of scale, means that competition in some two-sided platforms can be a race for the market. Moreover it is worth noting that two-sided platforms can tip easily. Buyers will tend to prefer (all other things equal) the platform that offers access to the most sellers, and sellers will tend to prefer the platform that offers access to the most buyers. Such network effects can tip the market towards being served by just one or two platforms. There is a risk that the asymmetric pricing structure described above could further increase the likelihood of such tipping occurring.

Evans and Schmalensee (2005) argue, although economies of scale may exist for a wide range of output they eventually can be exhausted and diseconomies of scale in the form of rising average costs will appear on one or both sides of the market, limiting the size of individual platforms. For example, marginal costs can increase as a platform becomes more complex when it expands in size or grows in functionality and features. Software programs are an example. Further, congestion costs can increase, reducing the appeal of a platform as it grows in size and complexity. A further constraint is product differentiation. There is often considerable scope for vertical differentiation where platforms can compete in different levels of product quality or service. Shopping malls may be up market or down-market as can nightclubs and dating clubs. Alternatively, platforms can compete through horizontal differentiation by appealing to different tastes and preferences among customers. Also intra-group (negative) externalities might constraint the size of a network. Consumers, when subscribing, might not only take into account the size of the other side but also the probability to reach a match with a consumer of the other side. Thus the more the people he faces on the side he belongs the less the probability to reach a match. Thus a customer might prefer to join a less crowded platform and overall the size of a platform might be capped.

CONCLUSION

To be successful the platform has to commit to user prices is feasibility. The dominant platform may find it more profitable to be in a multi-homing regime; however, the resulting level of social welfare is always higher under exclusivity. Thus under exclusivity, the dominant platform equilibrium is not always sustainable. Commitment is a weakly dominant strategy for the challenger, whereas the dominant

platform may prefer not to commit to its user prices in order to avoid having to set them too low. On the other hand, under a multi-homing regime, the dominant platform equilibrium is always sustainable. The dominant platform can keep the challenger out and make nonnegative profits by committing to its user prices; however, there are cases when no-commitment is viable and yields higher profits than commitment. Socially optimal pricing may arise in dominant platform equilibrium, under exclusivity as well as under multi-homing.

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